CLAIMS

1. An apparatus for continuously making a bristle subassembly comprising:

(a) a mandrel having at least three sides and having a moving cable support on each corner running a substantial length of the mandrel on the exterior corner of the mandrel;

(b) a wrapping means for continuously wrapping a polymeric filament around the axis of the mandrel to form a wrap of polymeric filaments; where the wrap of polymeric filaments is being supported and moved along a substantial length of the mandrel by the moving cable support;

(c) a means for feeding at least one base string outside of the wrap of polymeric filaments to a selected portion of the mandrel as required to form the subassembly while the wrap of polymeric filaments is being moved at least a portion of the length of the mandrel by the cable support of the mandrel;

(d) a means for continuously bonding the base string and polymeric filaments of the wrap together by simultaneously pressing the base string in contact with the polymeric filaments of the wrap and applying energy to the base string and the polymeric filaments of the wrap; and

(e) a cutting means for cutting the wrap of polymeric filaments at a point downstream of where the polymeric filaments of the wrap are bonded with the base string to form at least one bristle subassembly having at least one row of filament segments connected to at least one base string.

2. The apparatus of claim 1 wherein the means for bonding the base string and the polymeric filaments of the wrap together is a wave energy source that applies sufficient wave energy to partially melt at least one of the base string and the polymeric filaments of the wrap.

3. The apparatus of claim 2 wherein the wave energy source is an ultrasonic horn operated at 20-70 kHz and positioned adjacent to the mandrel and defines an opening sufficient to allow passage of the base string and the polymeric filaments of the wrap and maintains the base string in contract with the filaments of the wrap and does not allow the base string to reposition itself.

4. The apparatus of claim 1 wherein the wrapping means continuously forms the wrap by using at least one polymeric filament under controlled tension and the wrapping means rotates at controlled rates around the axis of the mandrel to form the wrap of polymeric filaments that is first brought into contact with a cable which is an endless cable and then with the base string.

5. The apparatus of claim 4 wherein at least one base string is positioned on at least one corner of a four sided mandrel outside of the wrap of polymeric filaments and each endless cable support runs along one corner along the length of the mandrel protruding outward from the intersection of the two side planes of the mandrel which form the corner of the mandrel and runs in an opposite direction in a recessed channel in the mandrel located on a diagonal side of the mandrel from said corner and does not protrude into the plane of the mandrel side.

6. The apparatus of claim 4 wherein at least one base string is positioned on at least one side of a four sided mandrel outside of the wrap of polymeric filaments and each endless cable support runs along one corner along the length of the mandrel protruding outward from the intersection of the two side planes of the mandrel which form the corner of the mandrel and runs in an opposite direction in a recessed channel in the mandrel located on a diagonal side of the mandrel from said corner and does not protrude into the plane of the mandrel side.

7. The apparatus of claim 1 wherein the means for bonding the base string and the polymeric filaments of the wrap together includes solvent bonding means.

8. The apparatus of claim 1 where the means for bonding the base string and the polymeric filaments of the wrap together is an adhesive bonding means.

9. The apparatus of claim 1 where a thermoplastic polymer is applied to the surface of the filaments of the wrap forming a connecting and supporting structure with the filaments of the wrap.

10. An apparatus for making bristle subassemblies, comprising:

(a) a mandrel having at least three sides and having a moving cable support on each corner running the length of the mandrel on the exterior corner of the mandrel;

(b) wrapping means for continuously wrapping a polymeric filament around the axis of the mandrel to form a plurality of polymeric filament wraps, adjacent ones being in contact with each other, wherein the wraps are supported and moved along a substantial length of the mandrel by the moving cable support;

(c) bonding means for continuously bonding the polymeric filament wraps together by applying energy to the polymeric filament wraps; and

(d) cutting means for cutting the wraps of polymeric filaments at a point downstream of where the polymeric filament wraps are bonded to form at least one bristle subassembly having at least one row of filament segments connected to each other along a bond line formed by applying energy.

11. An apparatus according to claim 10, wherein the bonding means is selected from the group consisting of heating means, adhesive means, and solvent means.

12. An apparatus for making a bristle subassembly comprising:

(a) means for continuously forming a wrap of polymeric filaments and including means for wrapping at least one filament around the axis of a four sided mandrel having a moving endless cable support on each corner, said endless cable support runs along one corner along at least a portion of the length of the mandrel protruding outward from the intersection of the two side planes of the mandrel which form the corner of the mandrel and runs in an opposite direction in a recessed channel in the mandrel located on a diagonal side of the mandrel from said corner and does not protrude into the plane of the mandrel side and moves the wrap of polymeric filaments along a substantial length of the mandrel;

(b) means for feeding pairs of base strings of a polymeric monofilament outside of the wrap of polymeric filaments on each side of the mandrel while the wraps are being moved substantially the length of the mandrel;

(c) means for bonding the base strings and the polymeric filaments of the wrap together by simultaneously pressing the base string in contact with the polymeric filaments of the wrap and applying energy to the base strings and the polymeric filaments of the wrap; and

(d) means for cutting the wrap at a point downstream of where the polymeric filaments of the wrap are bonded with the base strings to form bristle subassemblies each having at least one row of filament segments connected between two base strings; and

wherein the means for bonding of the base strings and the polymeric filaments of the wrap together includes means for moving the base strings and the filaments of the wrap under a wave energy source which is an ultrasonic horn positioned adjacent to the mandrel that defines an opening sufficient to allow passage of the base strings and the filaments of the wrap and maintains the base strings in contract with the filaments of the wrap and does not allow the base strings to reposition itself and sufficient wave energy is applied at a frequency of 20-70 kHz to partially melt at least one of the base strings and the filaments of the wrap.